

Rain simulation test

CS-1

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The “rain” simulator

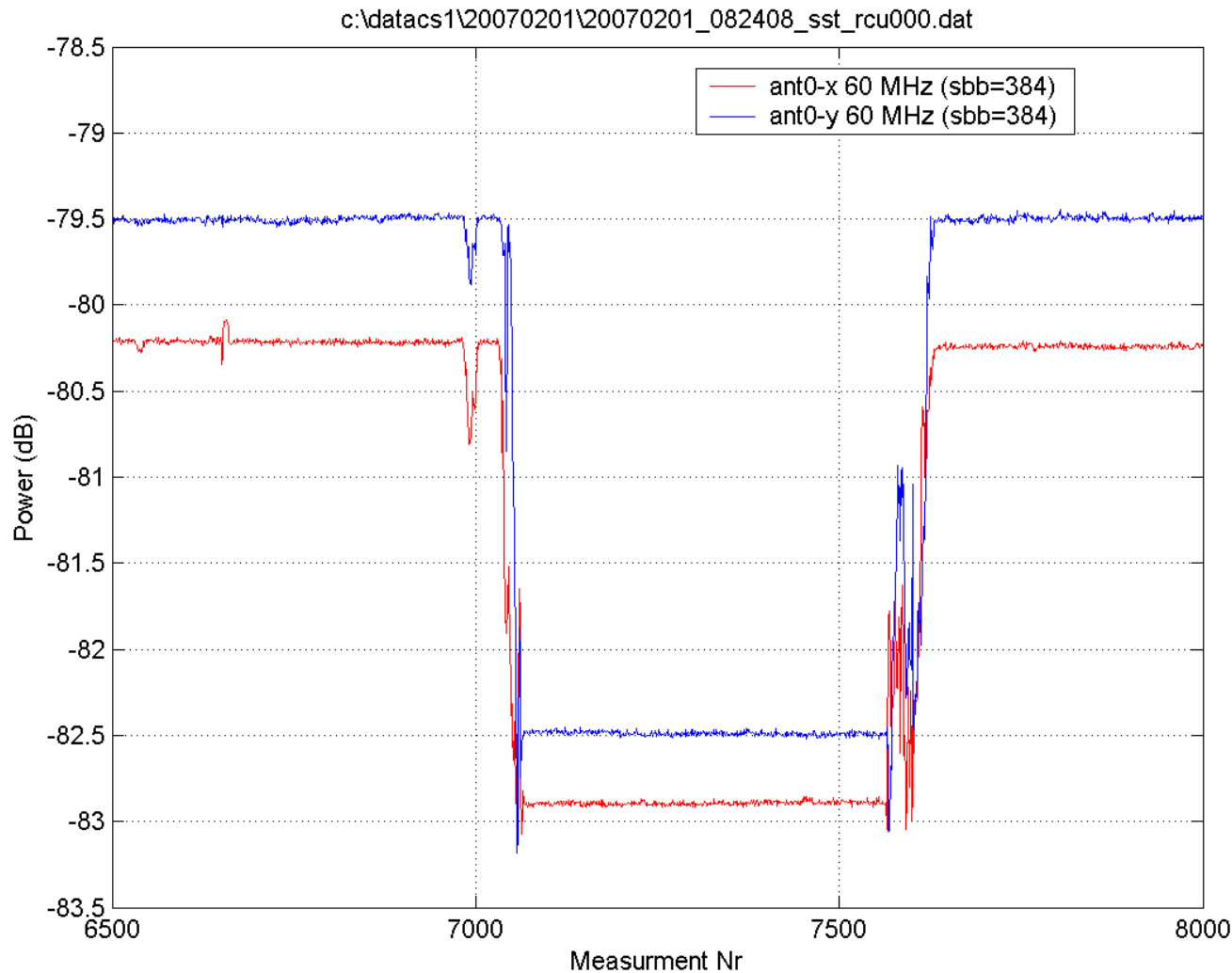


Antenna 0 (without foil)



Antenna 0-x (red) and Antenna 0-y (blue)

- Power drops 2.5-3 dB during removal of the foil
- Power is almost the same before and after the foil is removed



Ant 0 (without foil) & Ant 12

- only water on the groundplane



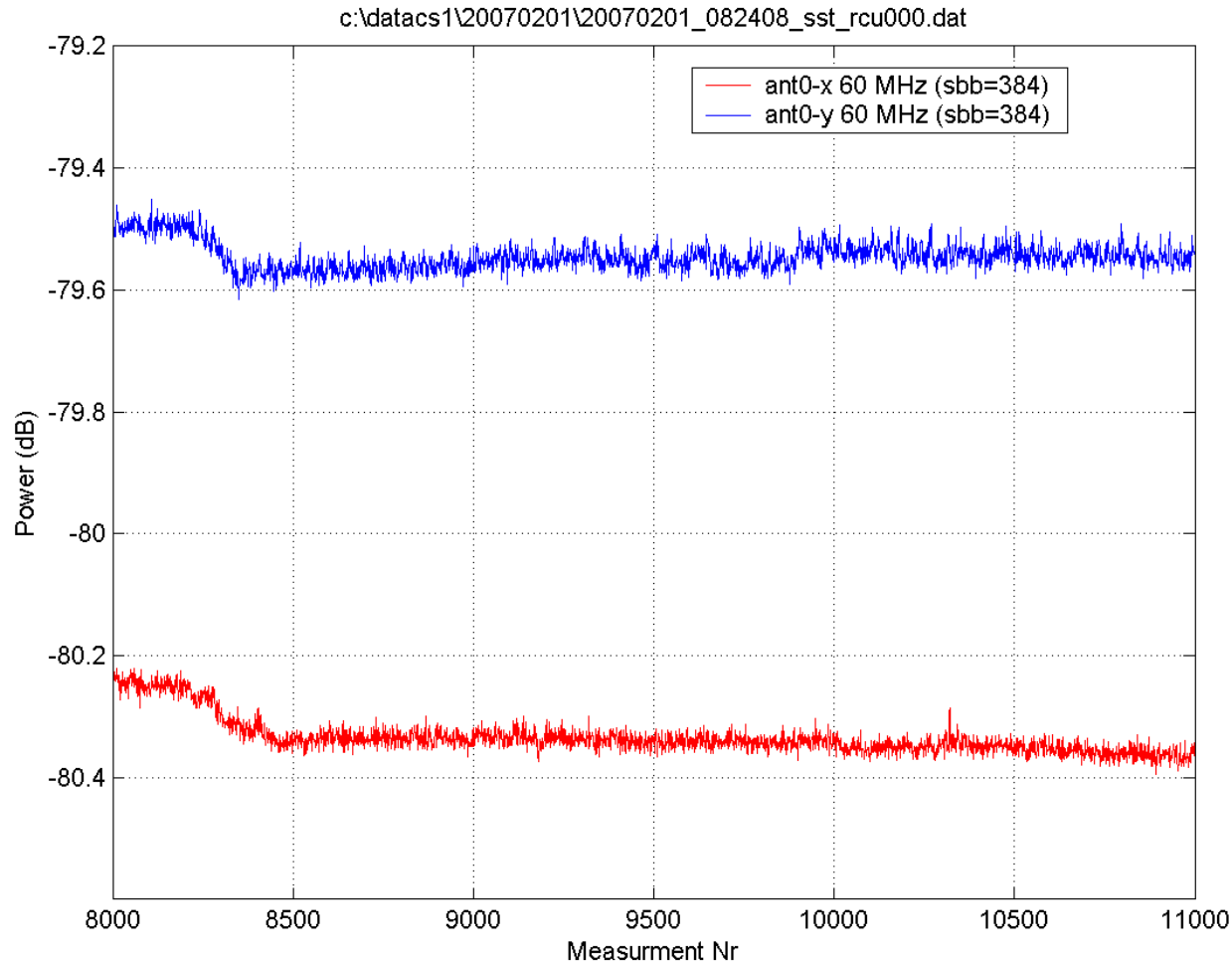
Ant 0 (without foil) & Ant 12

- only water on the groundplane



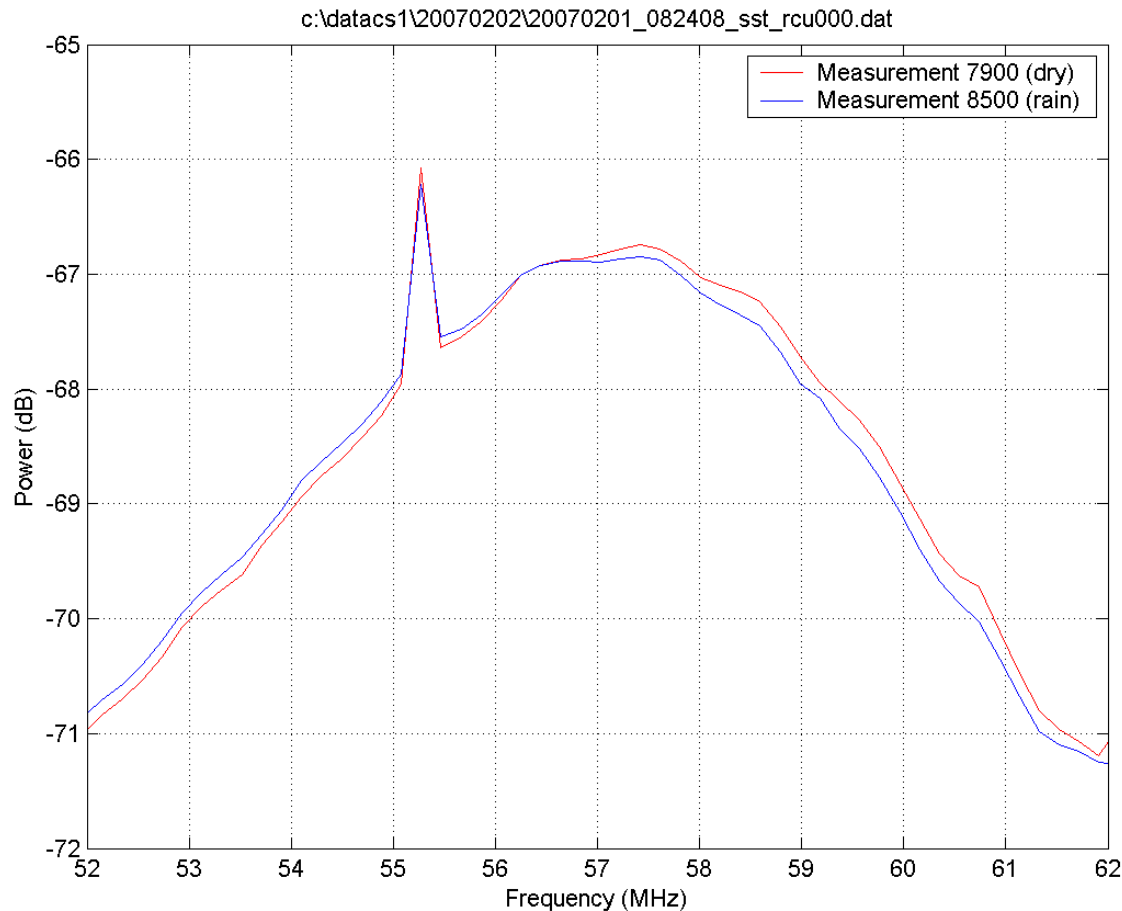
Antenna 0-x (red) and Antenna 0-y (blue)

- Tstart=8300, recovery time=45 minutes
- Power drops 0.1 dB after water on groundplane
- The recovearge of the power is very slow



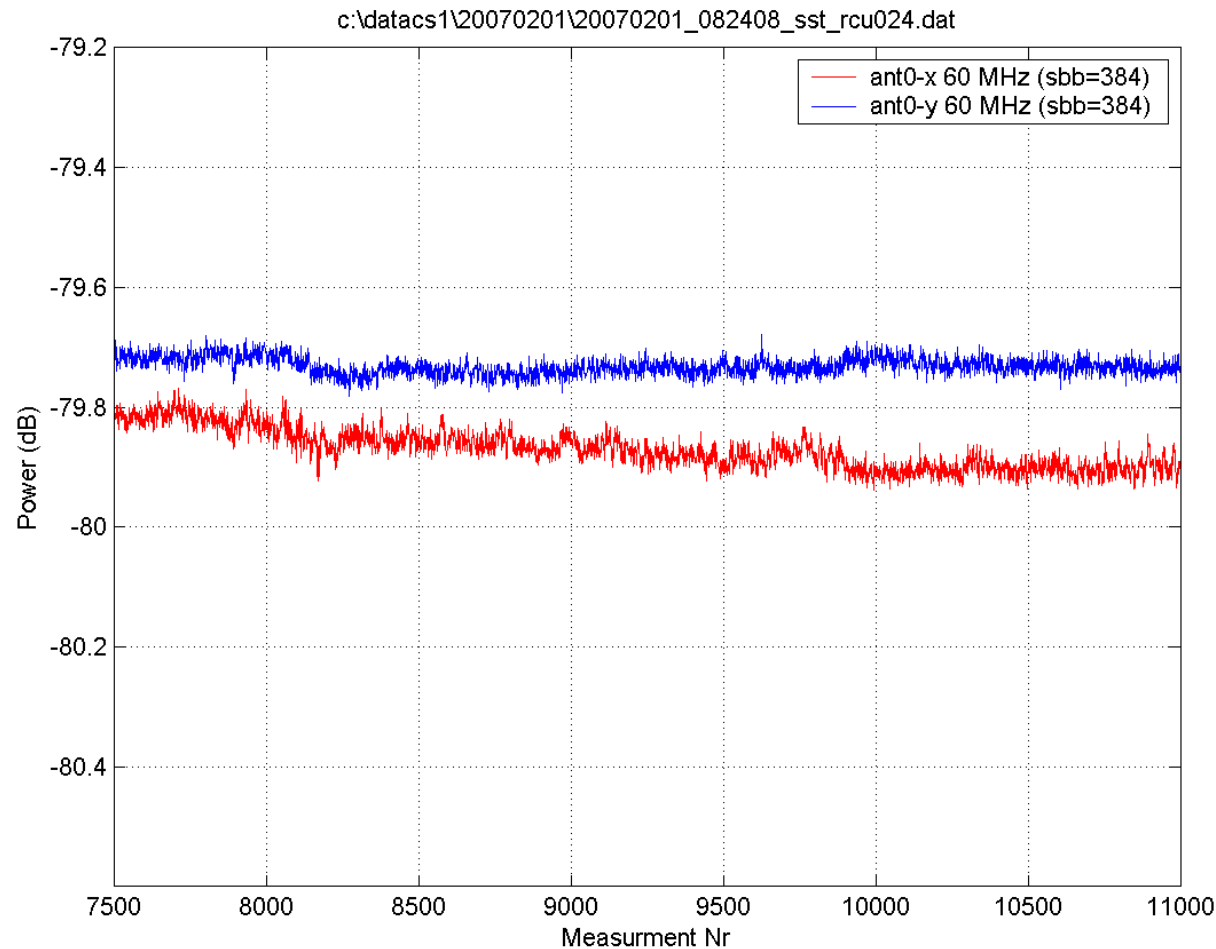
Antenna 0-x (red=dry) (blue=rain)

- Tdry=7900, Train=8500
- Shift down in resonance frequency (100-150kHz)



Antenna 12-x (red) and Antenna 12-y (blue)

- Tstart=8150, recovery time=45 minutes
- Power drops 0.05 dB after water on groundplane
- The influence is smaller with foil



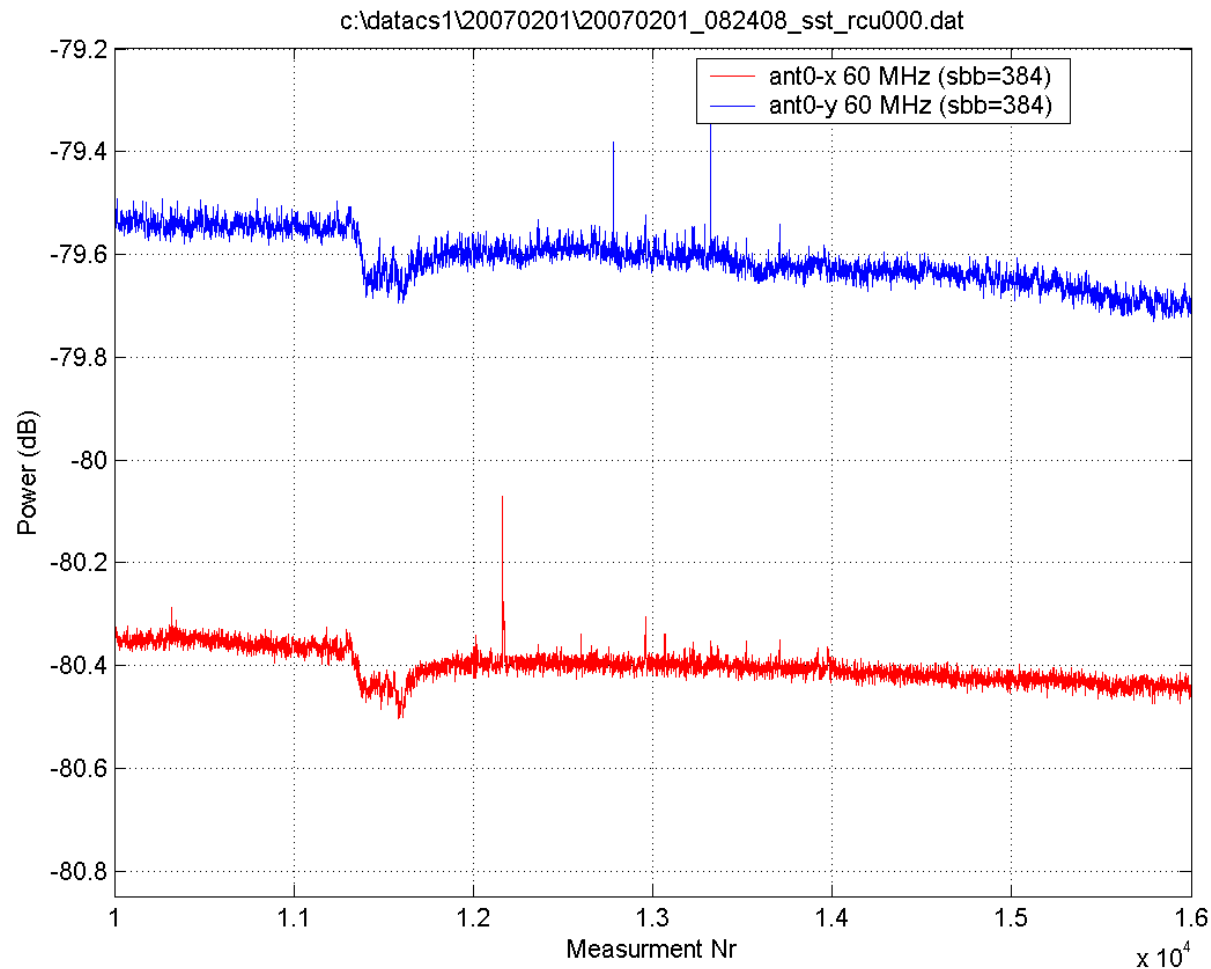
Ant 0 (without foil) & Ant 12

- groundplane and surround area under water



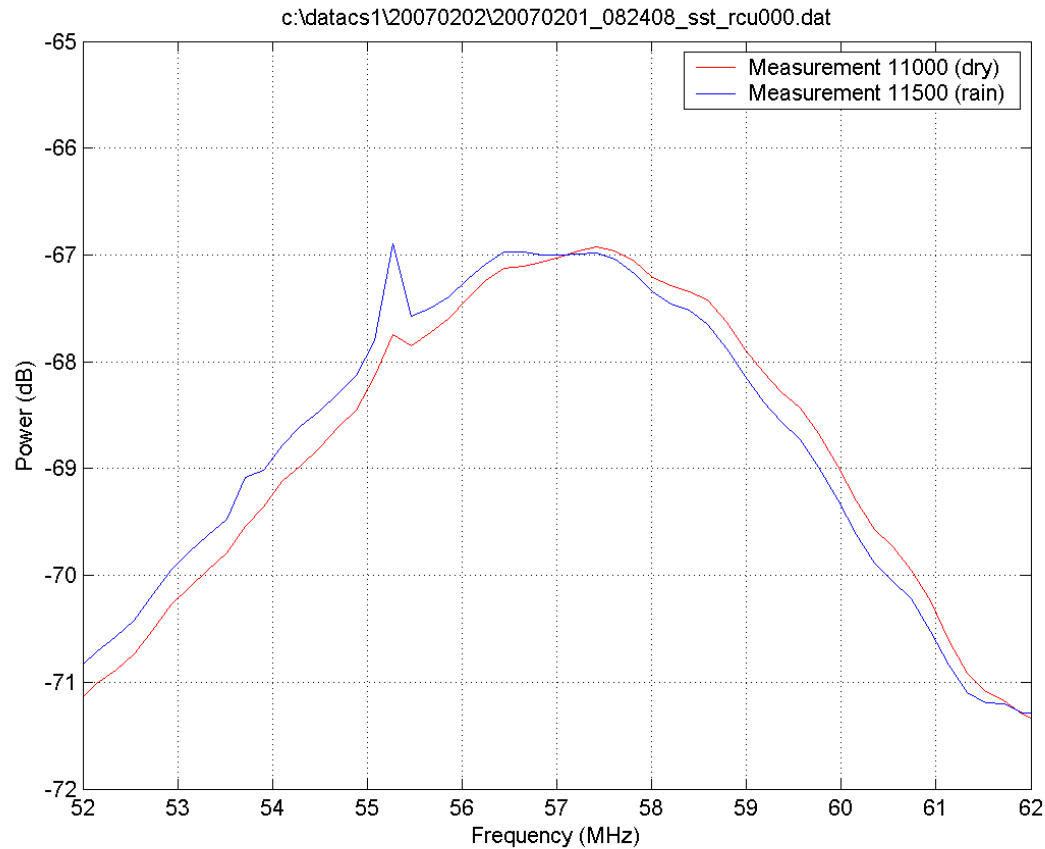
Antenna 0-x (red) and Antenna 0-y (blue)

- Tstart=11500, recovery time=75 minutes
- Power drops 0.1 dB after water on groundplane and area around
- First quick power recovery and later it becomes very slow



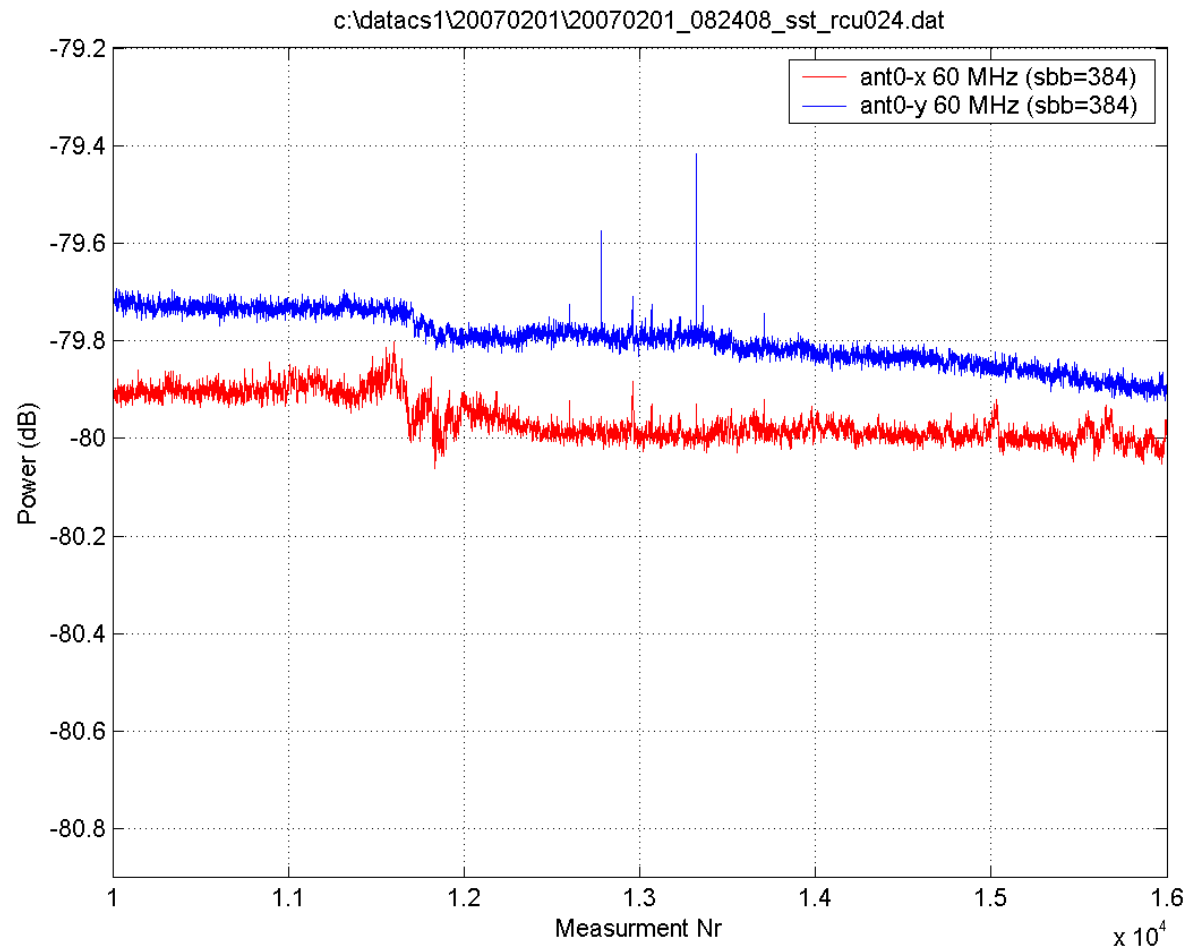
Antenna 0-x without foil (red=dry) (blue=rain)

- Tdry=11000, Train=11500
- Shift down in resonance frequency (200-300kHz)



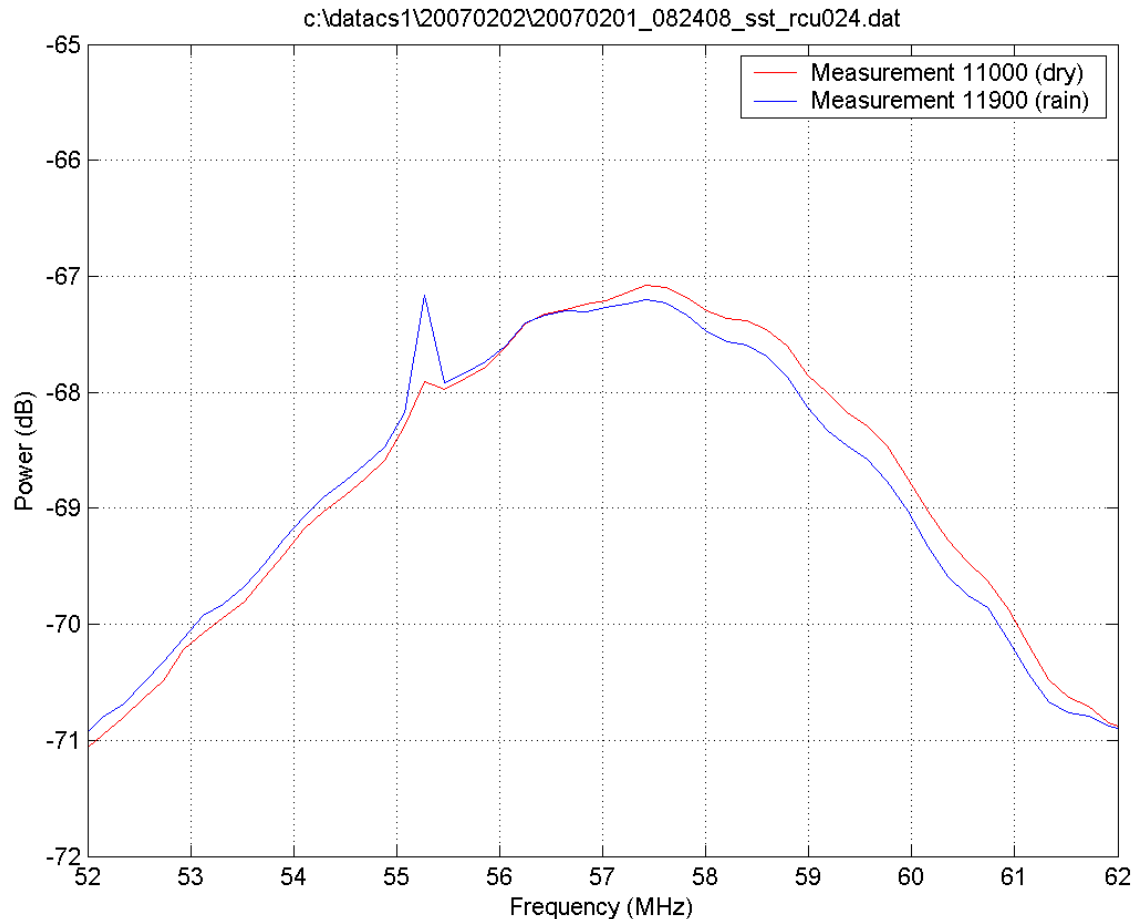
Antenna 12-x (red) and Antenna 12-y (blue)

- Tstart=11750, recovery time=75 minutes
- Power drops 0.1 dB after water on groundplane and area around
- First quick power recovery and later it becomes very slow



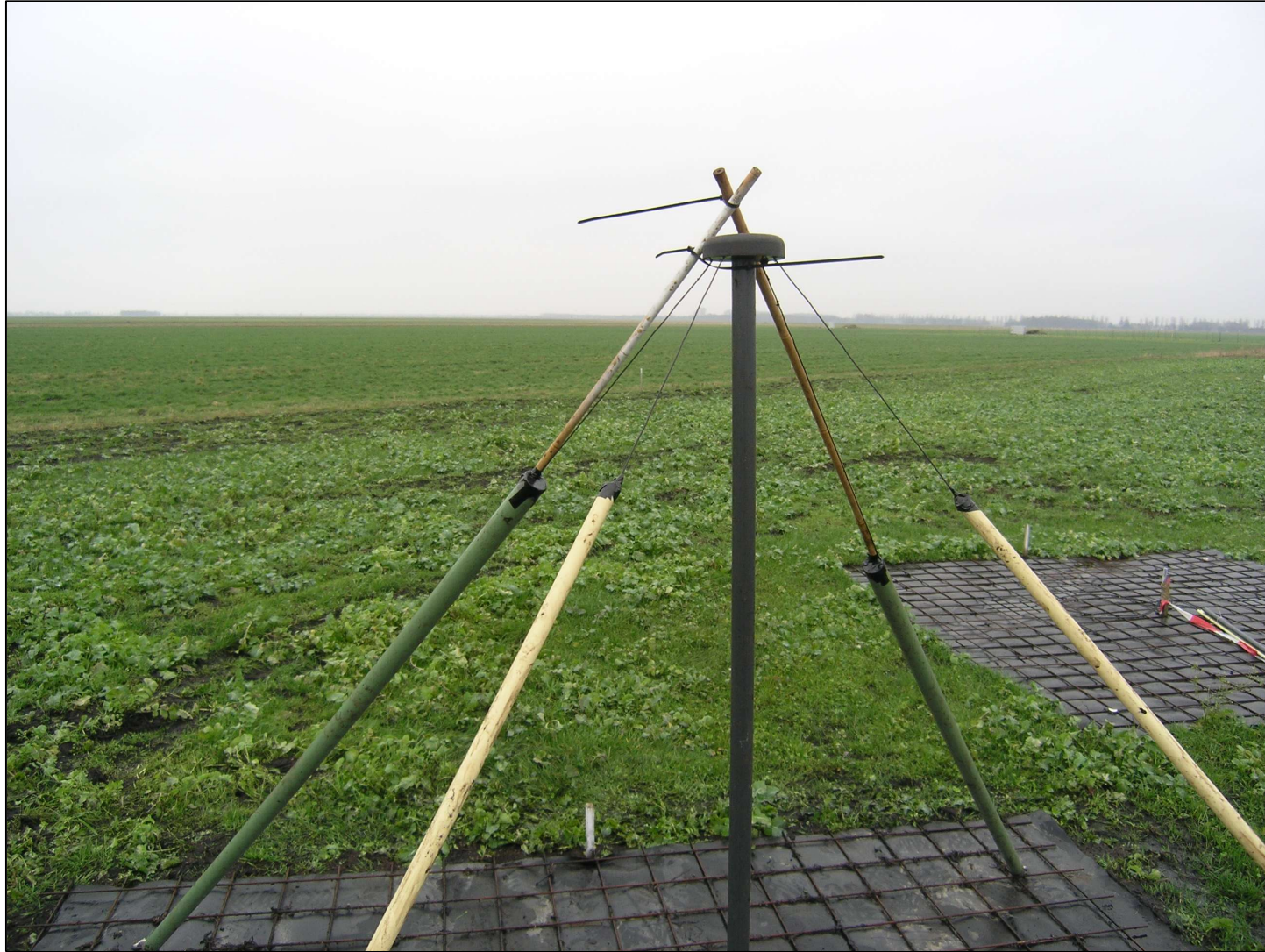
Antenna 12-x (red=dry) (blue=rain)

- Tdry=11000, Train=11900
- Shift down in resonance frequency (150-200kHz)



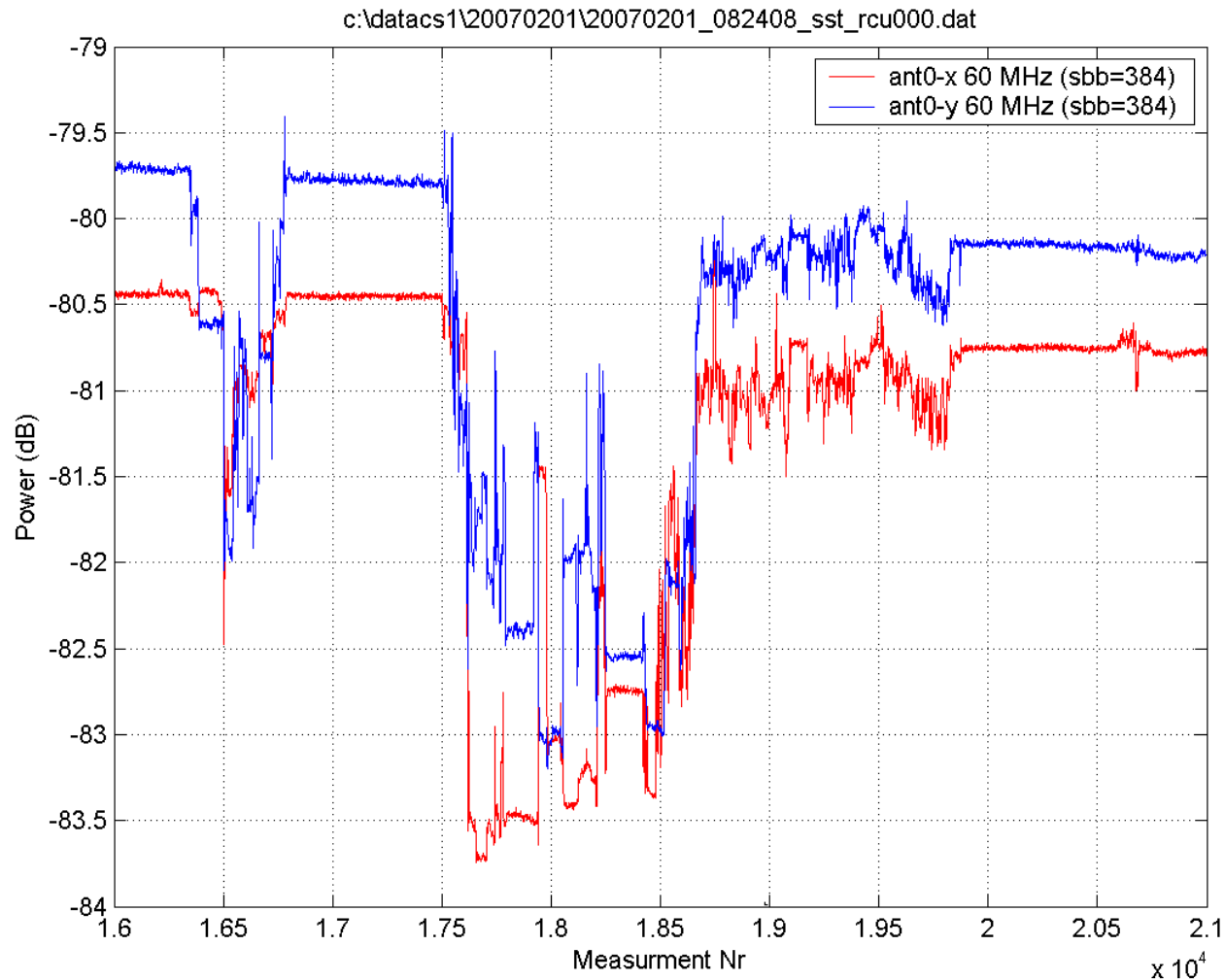
Antenna 0

- plastic pipes around dipoles, rubber spring and tension cord



Antenna 0-x (red) and Antenna 0-y (blue)

- The Power drops after the installation of the plastic pipes
- The cords and rubbers are very wet inside plastic pipes!



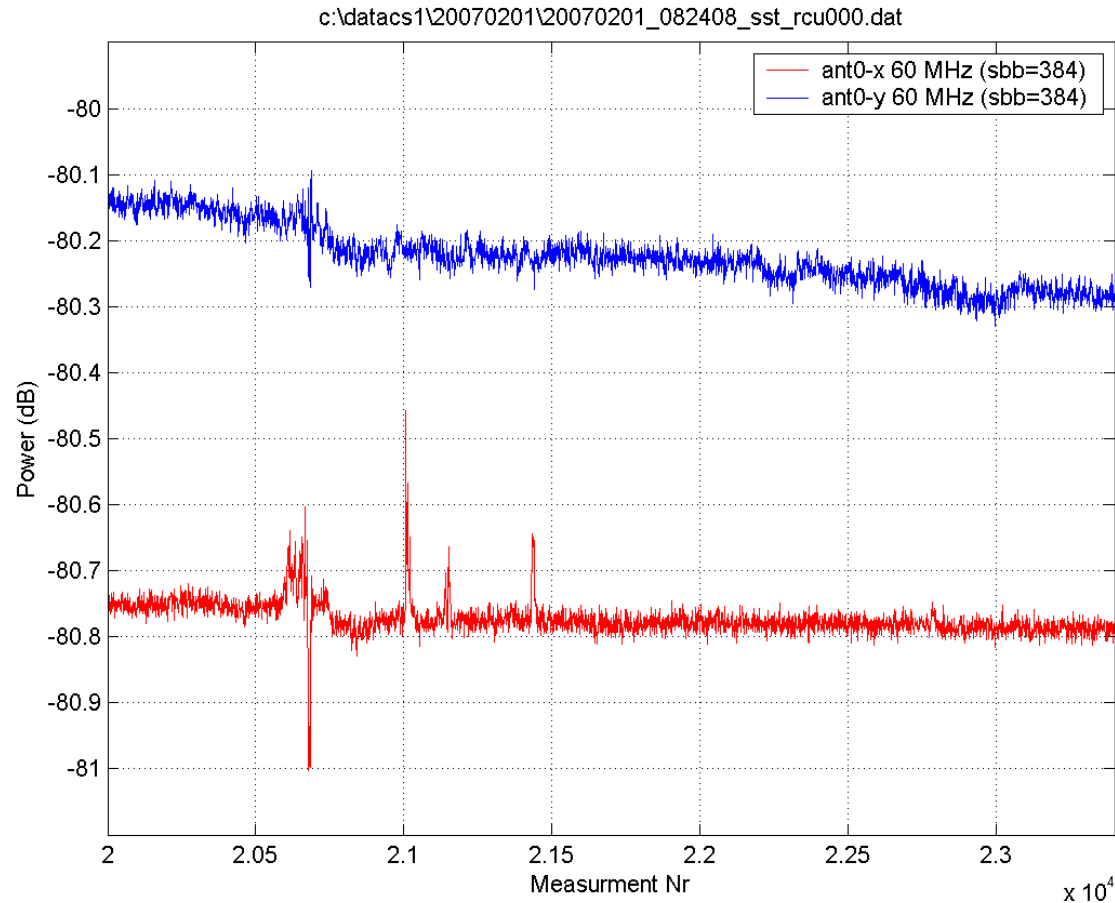
Ant 0 (plastic pipe) Ant 12 (unchanged)

- Water spray via the air over the antenna



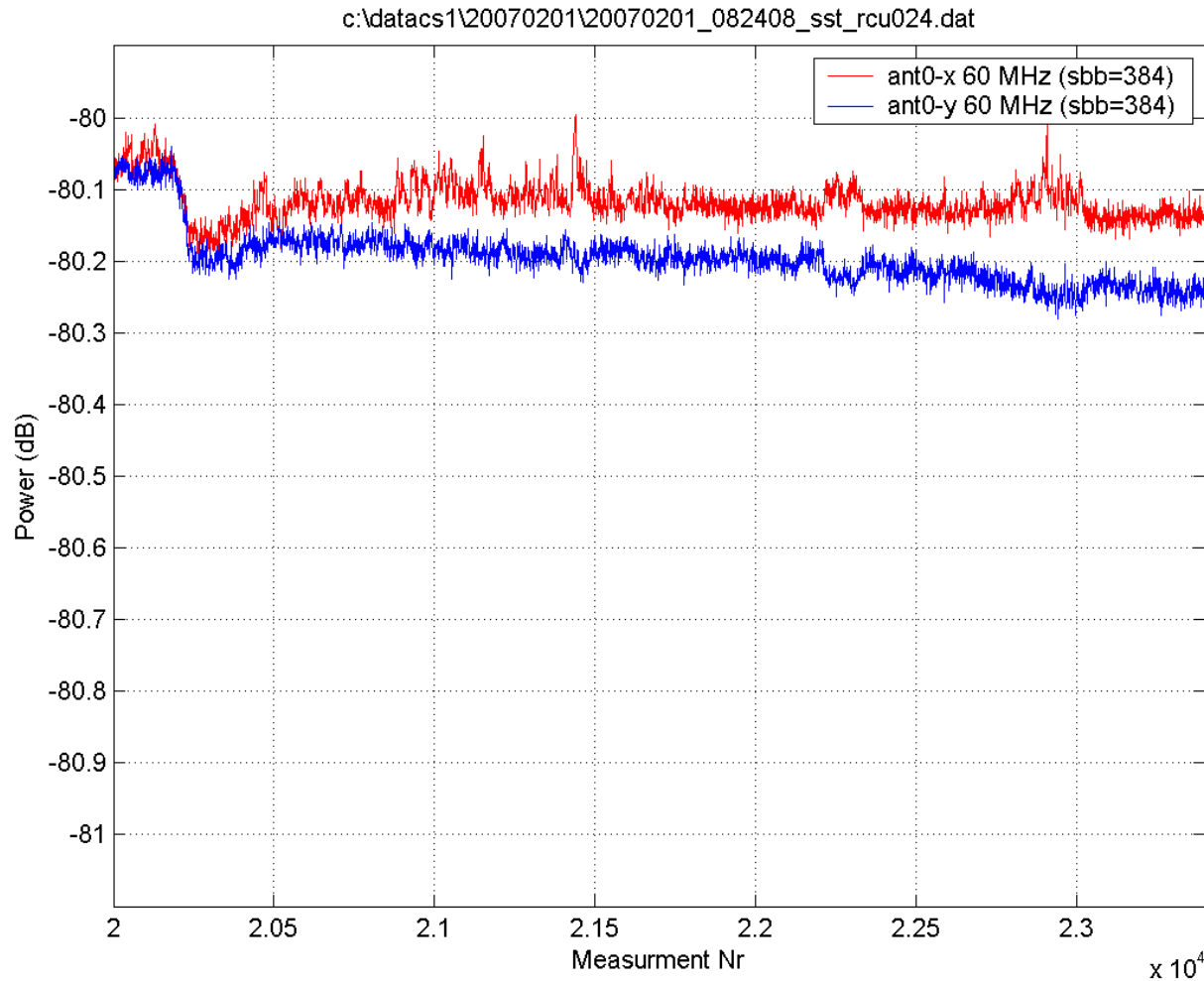
Antenna 0-x (red) and Antenna 0-y (blue)

- Tstart=20700, recovery time=45 minutes
- The power drop looks less then before



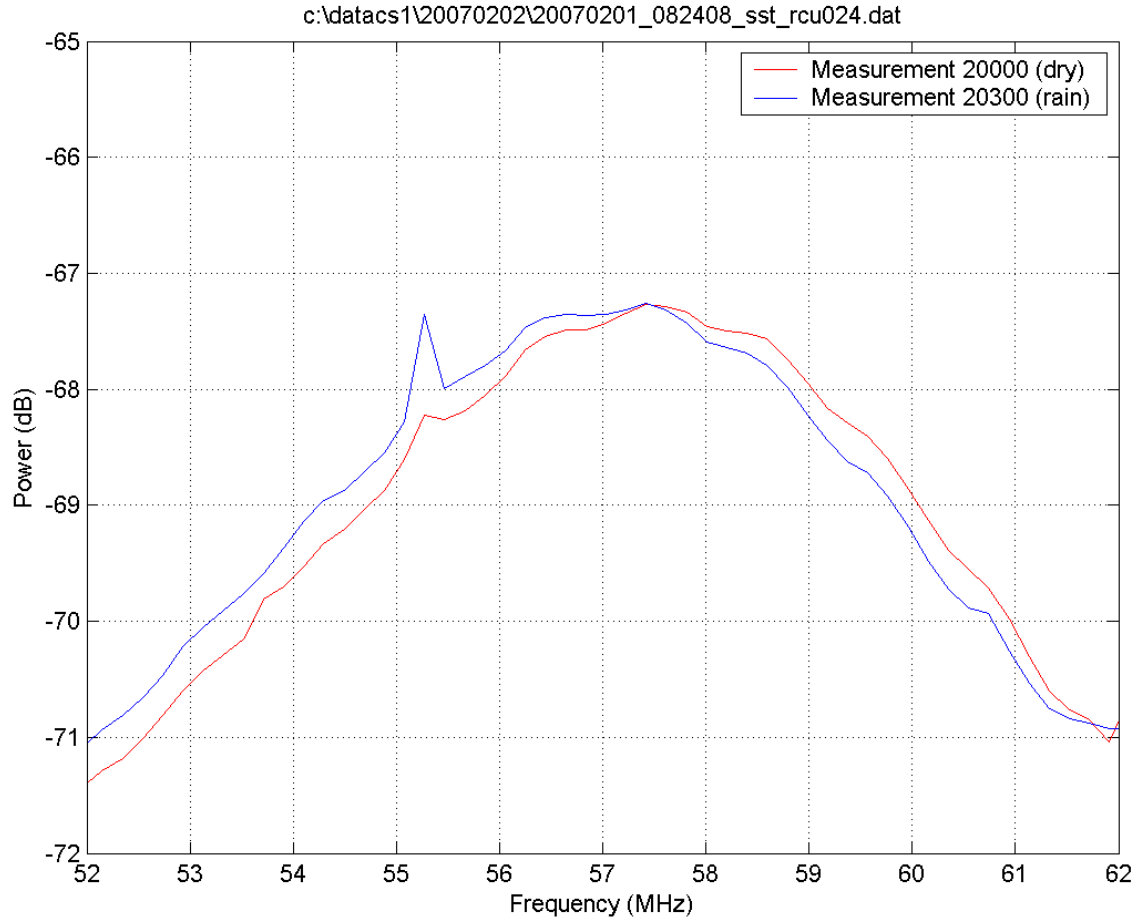
Antenna 12-x (red) and Antenna 12-y (blue)

- Tstart=20200, recovery time=45 minutes
- The power drop is more clear then for antenna 0



Antenna 12-x (red=dry) (blue=rain)

- Tdry=20000, Train=20500
- Shift down in resonance frequency (250-450kHz)



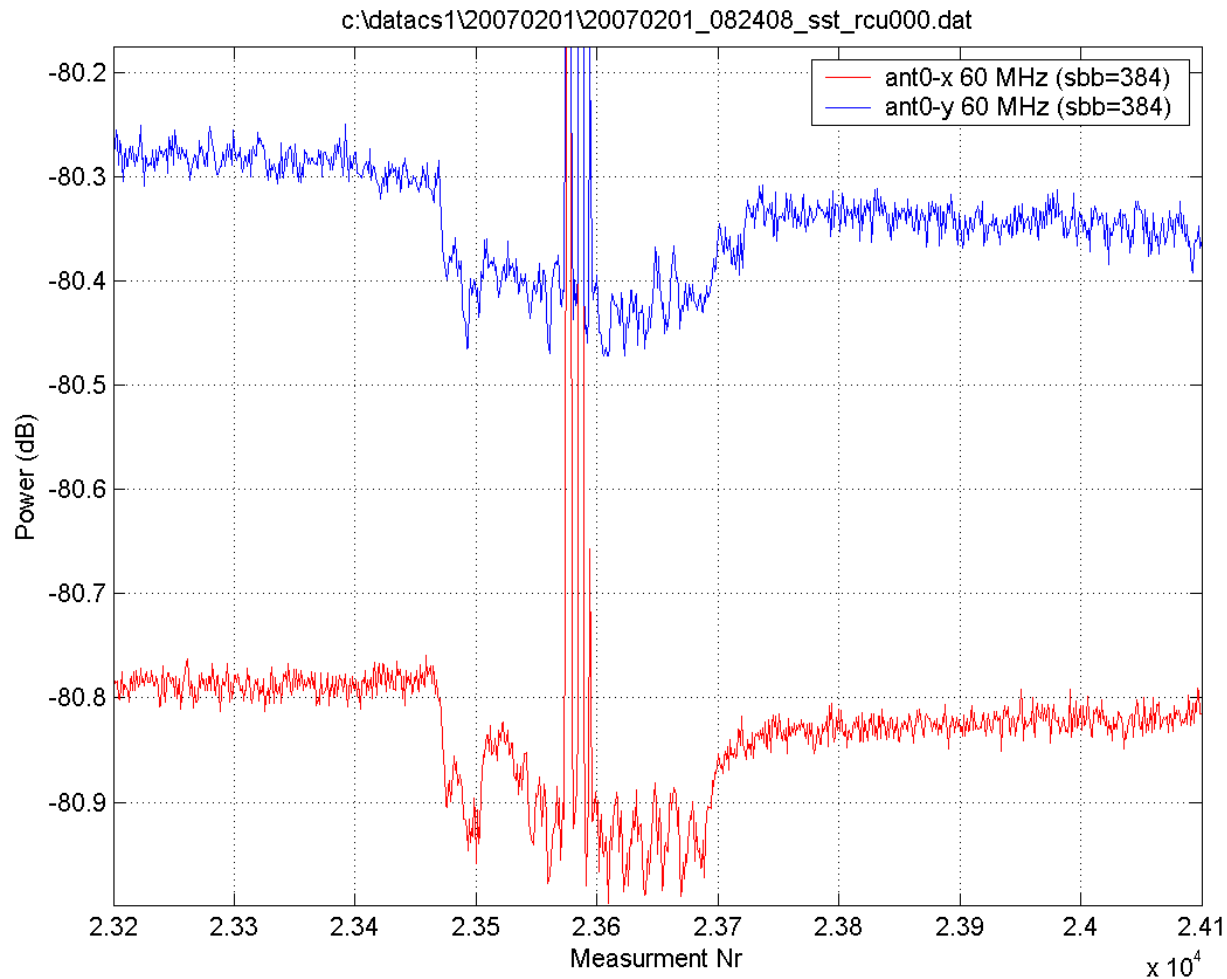
Antenna 0

- Water direct on the LNA



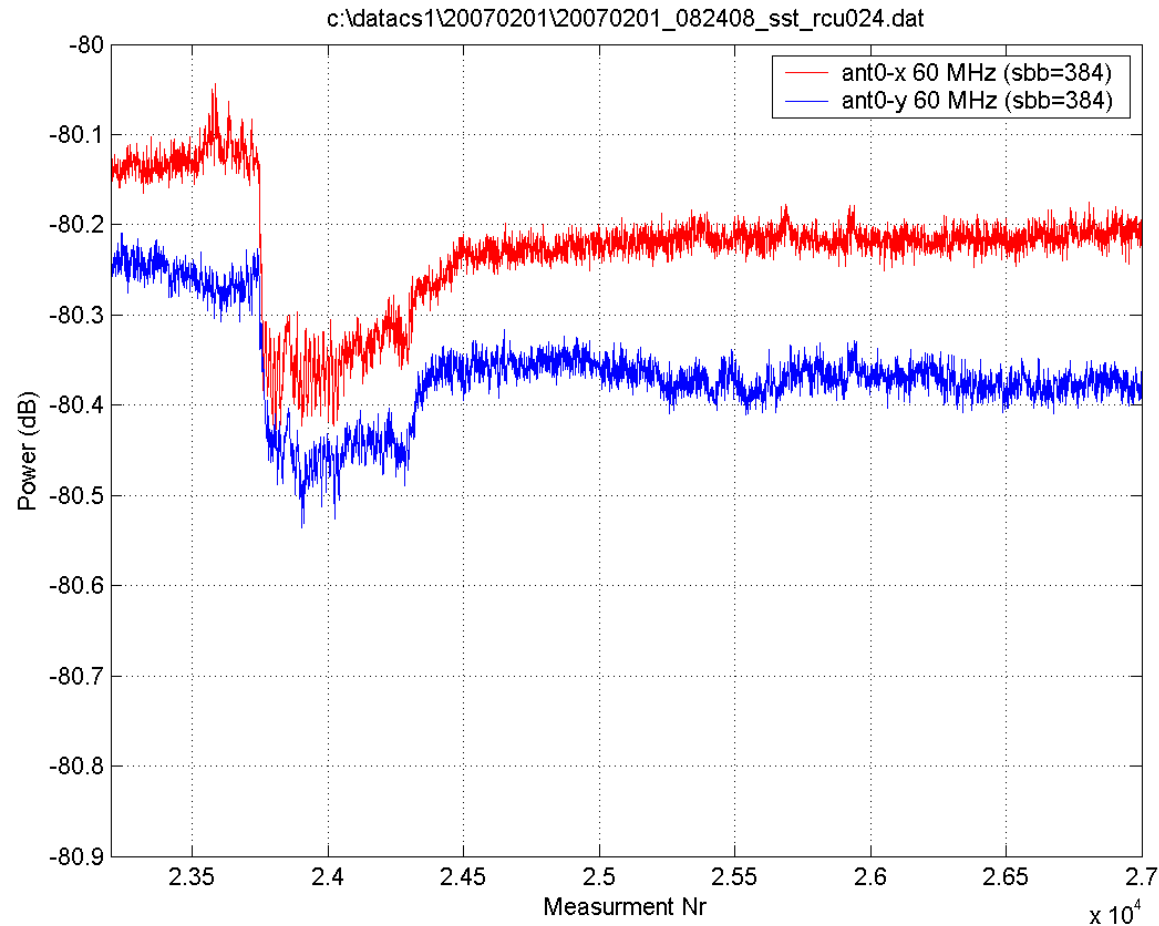
Antenna 0-x (red) and Antenna 0-y (blue)

- Tstart=23470, cooling time 5 minutes (23770)
- The power drop is only during cooling and recovers quick



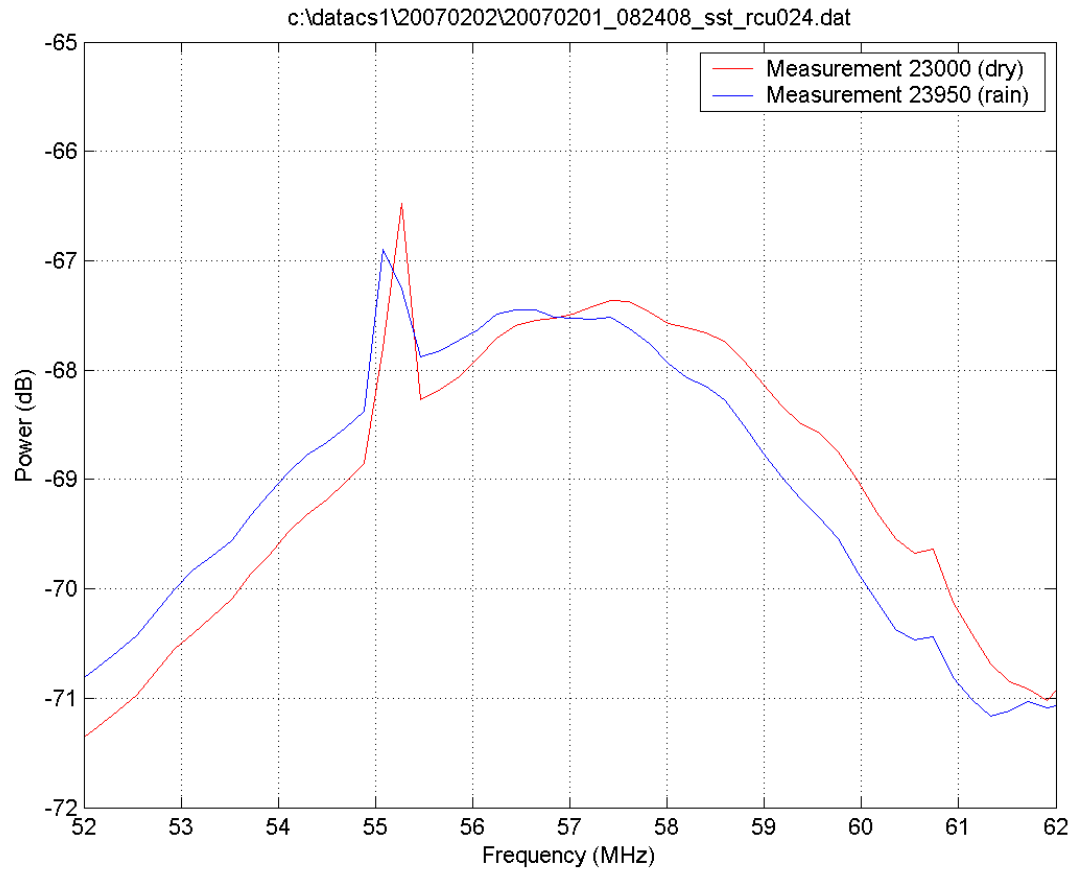
Antenna 12-x (red) and Antenna 12-y (blue)

- Tstart=23750, cooling time 10 minutes (24400)
- The power drop is only during cooling
- The recoverage is slower then antenna 0



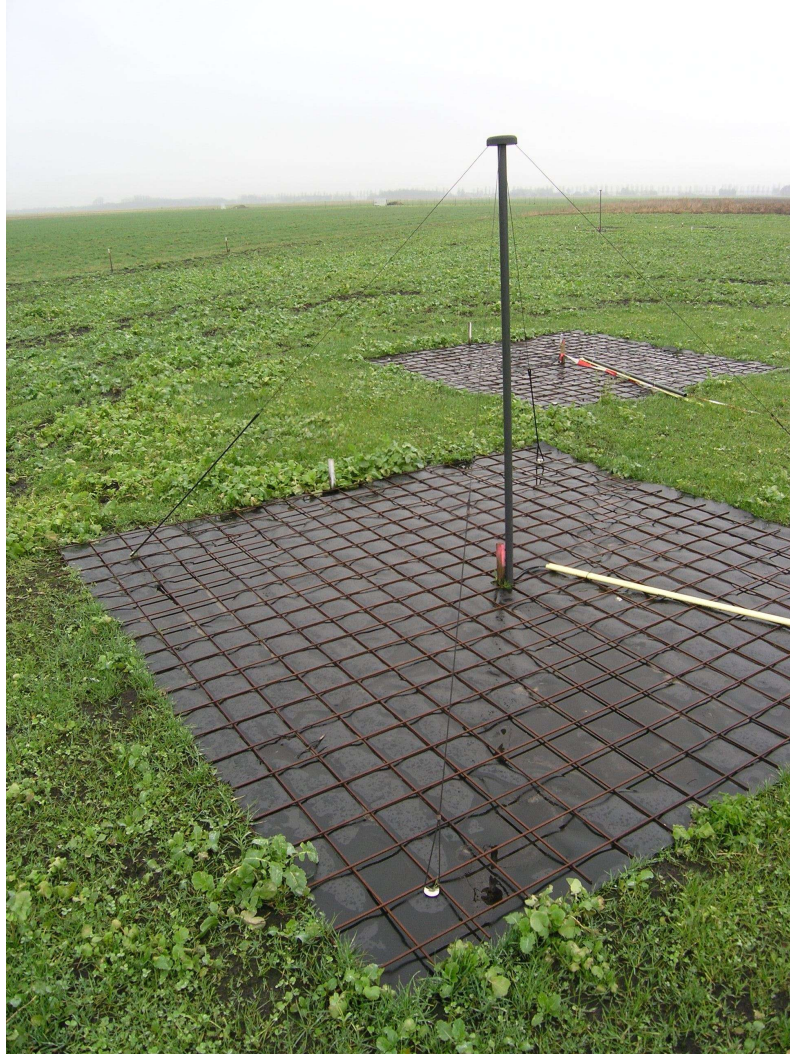
Antenna 12-x (red=dry) (blue=rain)

- Tdry=23000, Train=23950
- Shift down in resonance frequency (600-700kHz)



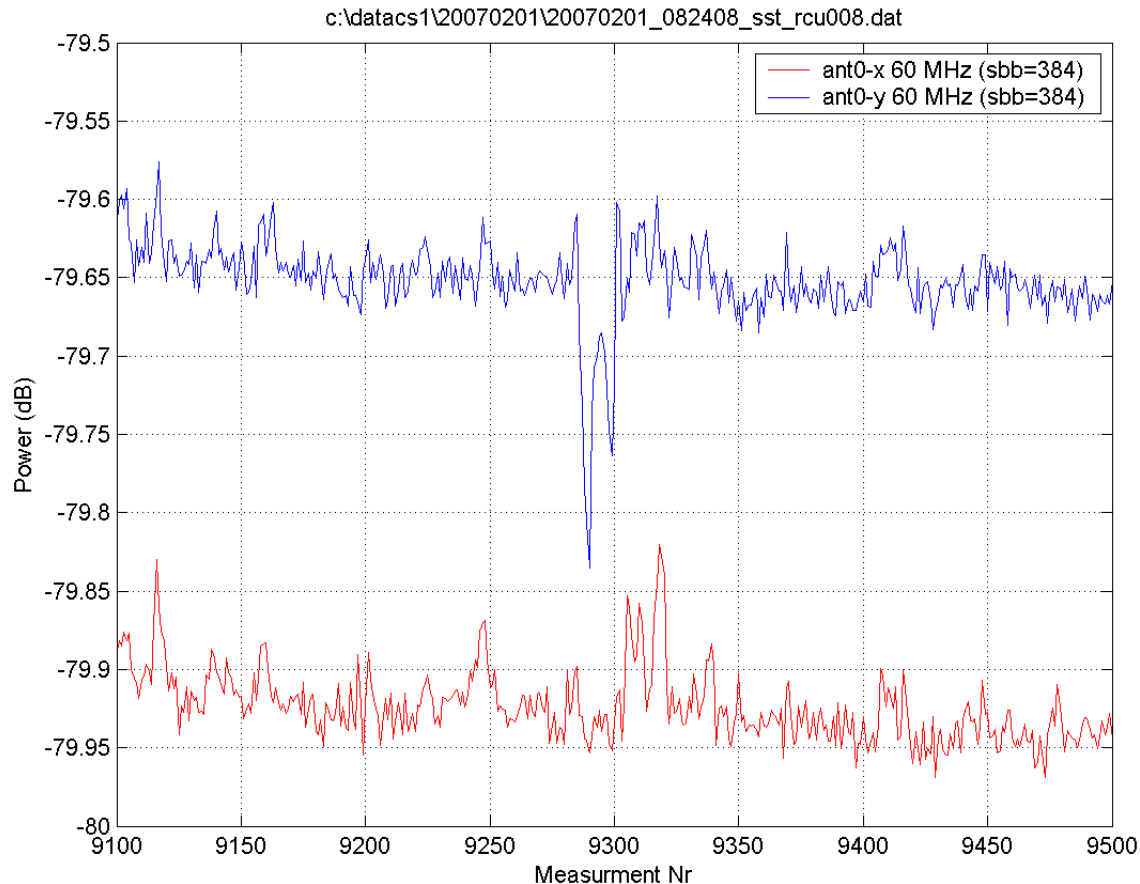
Antenna 4

- Water on EPDM rubber spring and tension cord



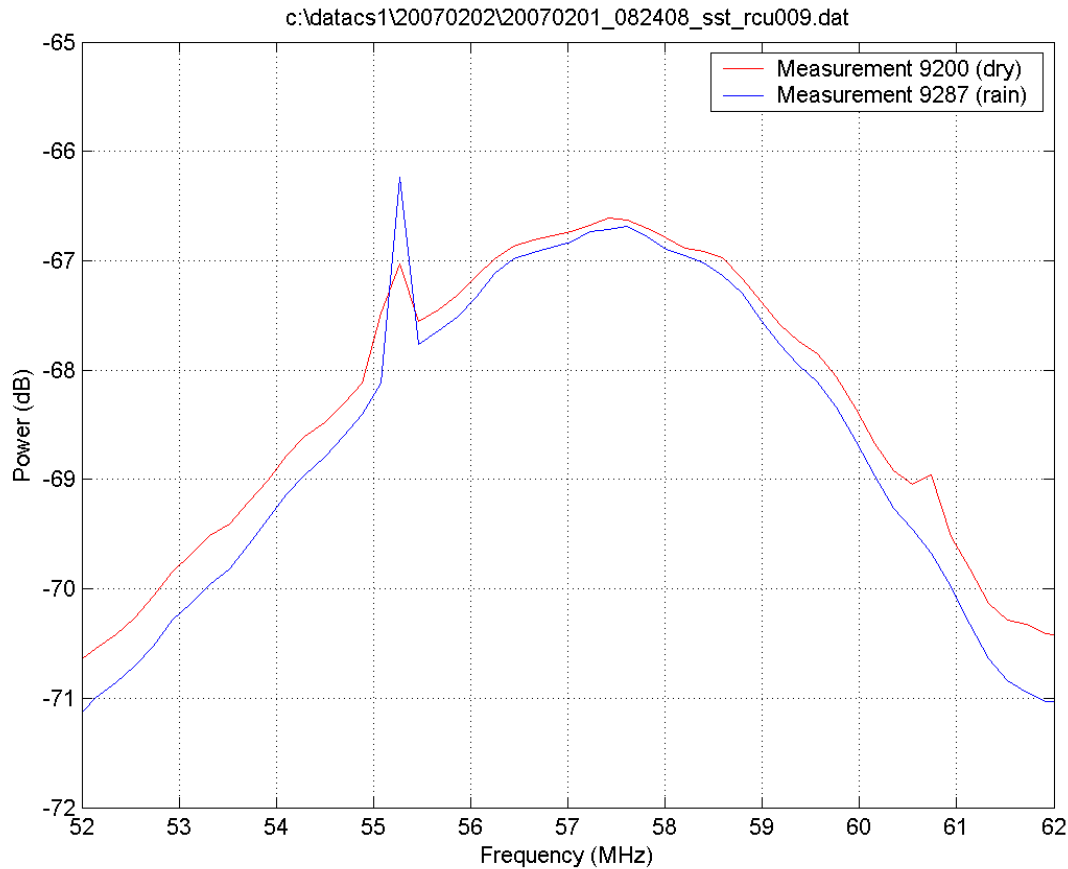
Antenna 4-x (red) and Antenna 4-y (blue)

- Tstart=9290, water on EPDM rubber spring
- The power drop is very short
- First the y wire and later the x wire



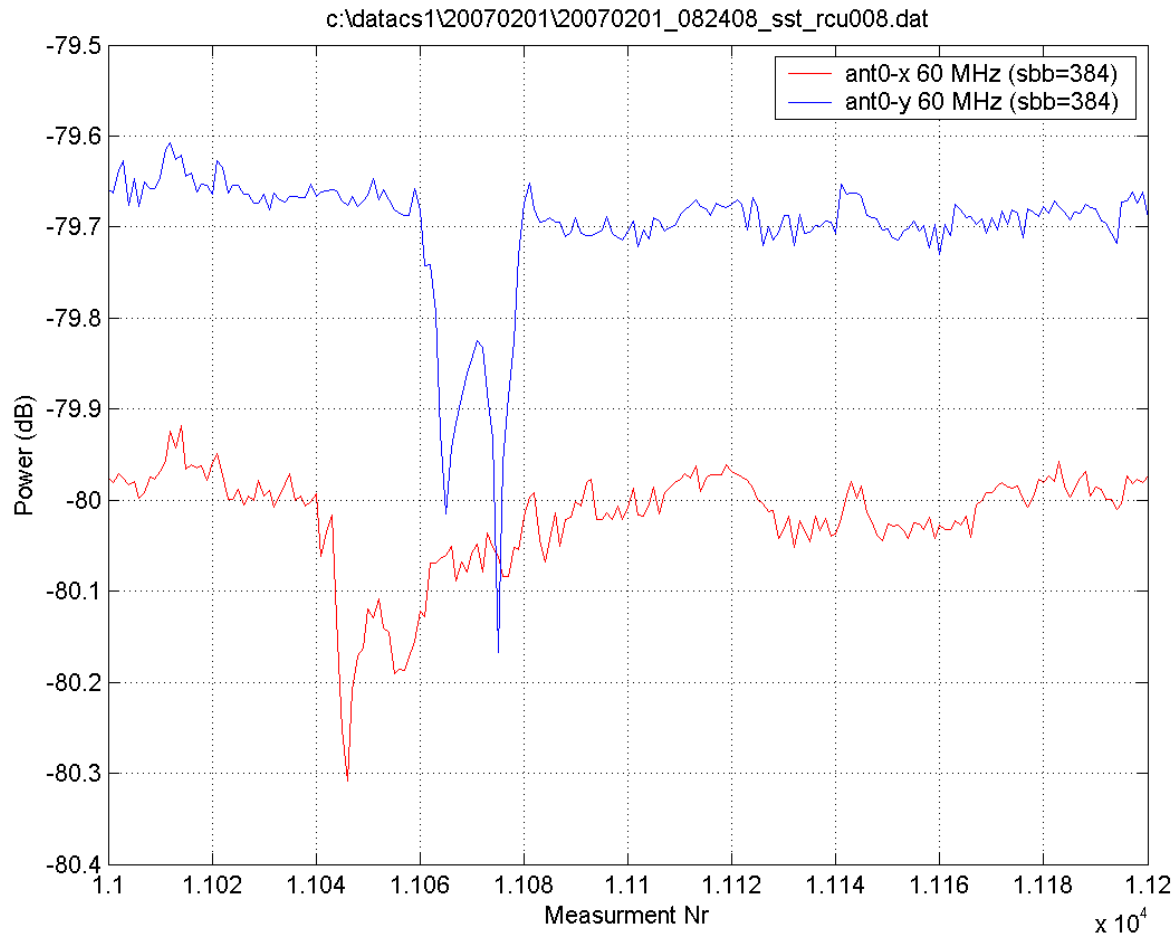
Antenna 12-x (red=dry) (blue=rain)

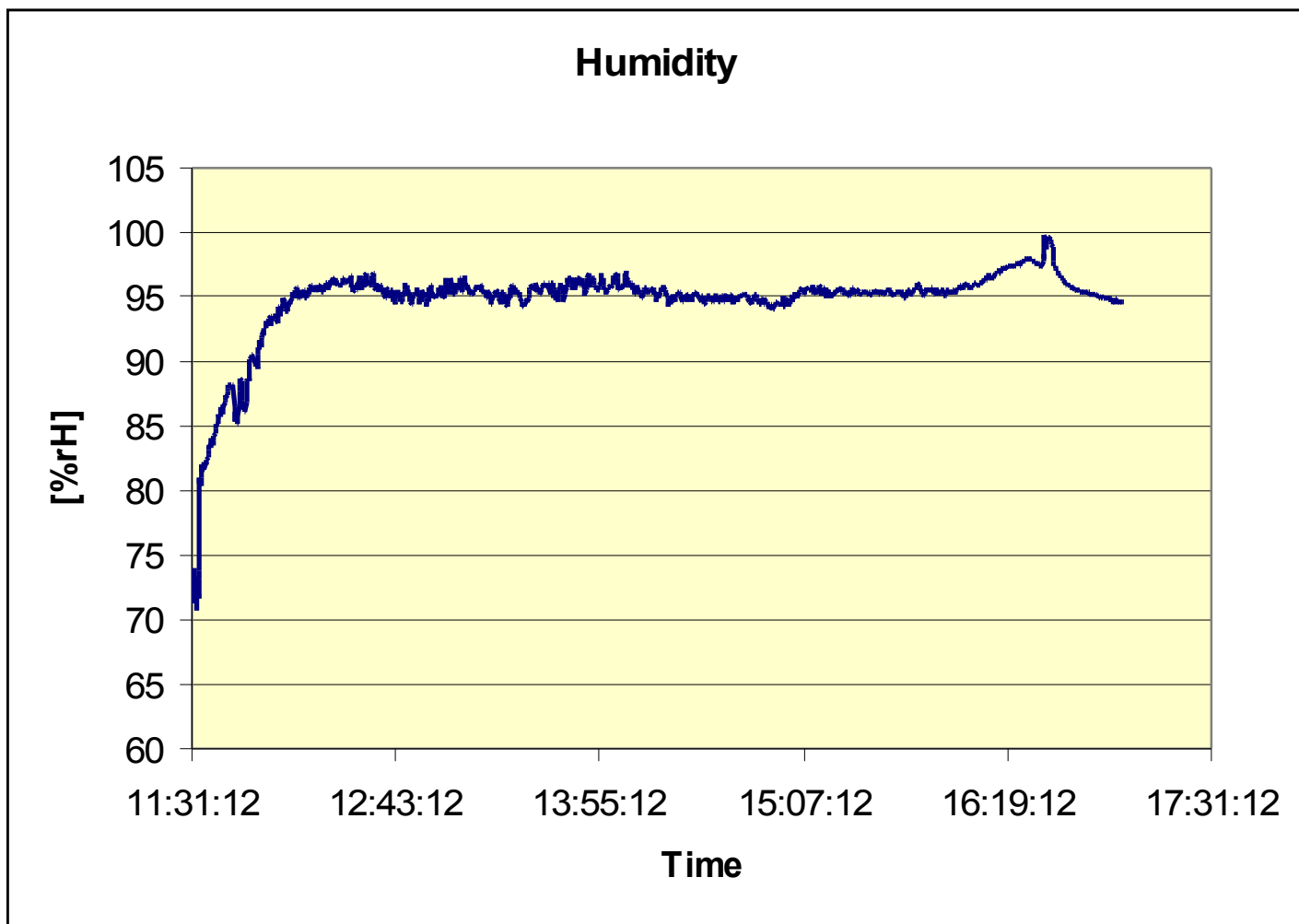
- Tdry=9200, Train=9287
- Shift in power 0.1 dB



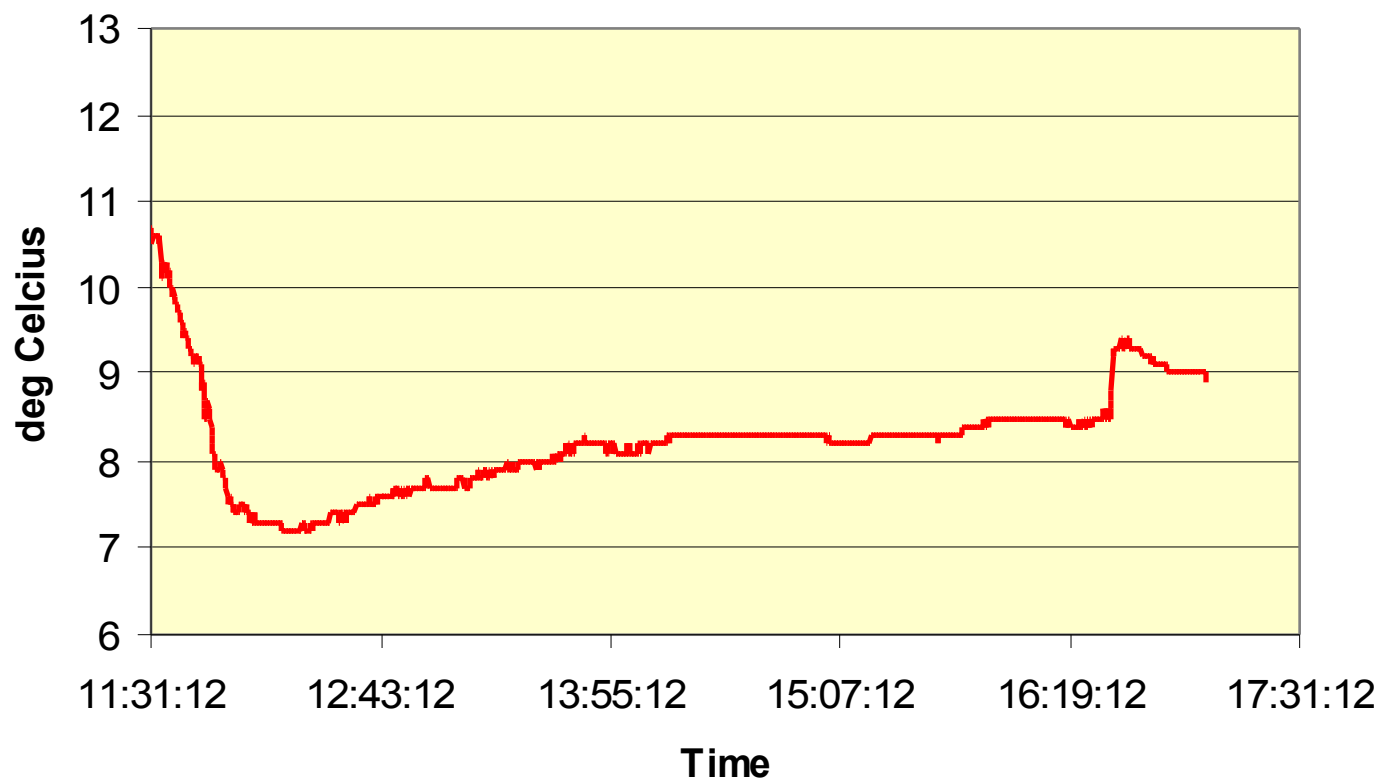
Antenna 4-x (red) and Antenna 4-y (blue)

- Tstart=11042, water on tension cord
- The power drop is higher but also very short
- First the x wire and later the y wire





Temperature



Conclusions

- The current **Low Band Antenna** design is sensitive for rain fall.
- The antenna with foil below the ground plane is less sensitive for rain fall then an antenna without foil.
- The **LNA** is sensitive for the rain as well. During the rain fall the temperature changes and so the noise power. The **recovery time** for the noise power is **short**.
- The **EPDM rubber spring** and the **tension cord** are also sensitive for rain. The tension cord is hygroscopic and the recovery time is longer then for the EPDM rubber. The noise power dip is only during the rain fall (short time constant). No frequency shift is found only power dip.
- When the **ground plane** and **surrounding area** are wet it takes more time for the noise power to recover (long time constant).
- Question?
 - Is it possible to calibrate for this “rain fall” effect.